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Credit Transmission Mechanism in Turkey: An Empirical Investigation

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ABSTRACT

The purpose of the study is to empirically test the presence of a bank lending channel in the Turkish economy. The empirical investigations are focused on the bank lending behaviour of 58 deposit money banks in the Turkish banking system over the period 1988-1999. The estimation methodology of the empirical analysis differs from that of similar studies in the literature, providing econometrically more efficient model estimates through exploiting dynamic panel data modelling with Generalized Method of Moments estimations.

The results of the model estimations provide no evidence of a potential for a bank lending channel to exist in the Turkish economy. Such an outcome is reflected in the lack of a significant relationship between the change in the monetary policy indicator and the growth rate of the loan supply in the estimated models. Categorizing the loan supply responses of banks with respect to bank size differences has not provided any significant improvement in revealing the evidence of a bank lending channel. The empirical results indicate that bank lending behaviour is influenced significantly by bank specific factors, such as the balance sheet strength and the quality of the asset portfolio, and by debt sales to the banking system.

JEL Classification: E42, E51, G21

Keywords: credit channel, bank lending channel, dynamic panel data, Turkey

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I. INTRODUCTION

Understanding the channels that transmit monetary shocks to real economic activity has always been an issue in the economics profession. In the monetary economics literature, different monetary transmission channels exist[1]: the interest rate channel, the exchange rate channel, equity price channels and credit channels. The ambiguous role of money stock in linking the price dynamics of financial and real sectors has directed the focus on the transmission through credit channels. The credit view of monetary transmission emphasizes the role of disaggregating non-monetary assets, such as bonds and bank loans. The credit view can be analysed with two perspectives: the narrow bank lending perspective and the broader balance sheet channel perspective. The former, which is the subject of this study, is limited to bank lending behaviour, while the latter, which links firm investment decisions with bank lending behaviour, captures all credit market interactions.

As the major financial intermediary institutions in the economy, banks play a significant role in the determination of output by supplying funds for investment finance in the real economy. Bank loans constitute the major part of the sources of external finance for most firms. Therefore, economic activity appears to be sensitive to shocks on bank lending behaviour. Any monetary shock influencing the bank reserves is expected to cause asset re-allocation in the bank balance sheets. If this allocation cannot be done in such a way that the effects of the shock are absorbed by some other assets than loans, the availability of bank loans to firms and, hence, the investment decisions of the bank-dependent firms, will be affected. It has to be noted that this effect is a supply effect rather than a demand effect generated by changes in the interest rates. The supply effect, which is transmitted by the credit channel, and the demand effect, which is transmitted by the interest rate channel, can be observed together. However, realizing the relative magnitudes of these effects may be important for the precision in policy making.

The factors that increase the relative potency of the transmission through the credit channel are credit market imperfections. The major imperfections that influence the lending behaviour of banks are their asymmetric cost structures in raising external finance and in evaluating and monitoring loan contracts. The difference in the size of banks is one of the factors that can be considered as the cause of asymmetric cost structures. The asset size differences among banks may reflect the basis of the relative cost advantages in banks' raising

[1] See Mishkin (1996) for an overview of the transmission mechanisms of monetary policy.

external finance. This asymmetry leads to disproportionate lending responses of banks to monetary shocks unless banks buffer themselves against shocks through their liquid assets. The disproportionate lending responses of banks to monetary shocks are also transmitted to bank dependent firms in a disproportionate manner. Provided that the majority of the producer firms are dependent on bank loans as a source of external finance, there will be real output effects of monetary shocks in the aggregate economy because the supply of funds for financing investment projects and working capital needs are affected. Therefore, investigating the loan supply responses of banks is a crucial step in testing the credit view, particularly, the bank lending channel.

Understanding the interaction between banks and the real economy in Turkey requires theoretical and empirical investigations on the bank lending channel of the monetary transmission mechanism. Since recently, the linkage between the banking structure and economic stability has been on the agenda of policy makers in order to reduce the propagated effects of banking crises. In this respect, the tendency of re-structuring the banking system in Turkey has been such that a few large banks exist and the share of public banks is reduced for economic stability. In practical terms, this indicates that in the Turkish economy a bank lending channel, which propagates the output effects of monetary shocks seems to be prevailing.

The purpose of this study is to empirically test the presence of an active bank lending channel in Turkey. The empirical investigations are focused on the bank lending behaviour of 58 deposit money banks in the Turkish banking system over the period 1988-1999. To our knowledge, this is the first study in the literature analysing the bank lending channel of monetary transmission in the Turkish economy. Moreover, the estimation methodology of the empirical analysis used in the study differs from that of similar studies in the literature, providing econometrically more efficient model estimates.

The plan of the study is as follows. The second part is a presentation of the credit view of the monetary transmission mechanism, explaining the operational features of the credit channel, the role of informational asymmetries on the dynamics of the credit markets, and the preconditions for monetary policy to affect the economic activity through the bank lending channel. This part also contains an overview of the credit market and banking structures in the Turkish economy in the period in question. The empirical investigation of the subject takes place in the third part of the study. This part starts with the modelling aspects of the bank lending channel, continues with brief descriptions of the econometric

methodology and the data exploited in the study, and ends with the estimation results. The study is completed with concluding remarks based on the empirical findings.

2. THE CREDIT VIEW OF THE TRANSMISSION MECHANISM

2.1. The Credit Channel

The traditional 'money view' of the monetary transmission mechanism is based on the so-called *money* or *interest rate channel*, featured by the standard Keynesian IS-LM framework. The basic assumptions that characterize the interest rate channel are: i) sticky-price adjustment to money supply shocks, ii) direct control of the monetary authority on nominal money supply by adjusting reserves, and iii) presence of two assets such as money and bonds where loans are perfect substitutes for bonds. In the context of the last assumption, there is no need to explicitly model bank behaviour in explaining the money-output causation. However, the 'credit view' of the monetary transmission mechanism puts a special emphasis on the role of financial intermediaries or banks in the aggregate economic activity.

The role of intermediation in the monetary economics literature has been ignored with the assumptions of perfect capital markets and homogenous financial structure, in the context of what is known as the Modigliani-Miller theorem. As such, finance is postulated to be a "veil" which implies that intermediary institutions are redundant and the financial structure of firms is irrelevant to real output effects. However, Bernanke (1983) rejects this postulate and states the role of economic institutions in producing real effects. Referring to the persistent effects of the Great Depression in the 1930s, Bernanke argues that the increased credit intermediation costs, coupled with credit squeeze during the financial crisis, propagate the real effects of the turmoil. This indicates the significance of financial intermediary institutions in affecting the transaction costs and thus the real economic activity. Following Bernanke and Blinder (1988) and Bernanke and Gertler (1987), when loans are assumed imperfect substitutes, the monetary transmission mechanism operates not only through the *interest rate channel*, but through a *credit channel* as well. It is now assumed that firms can finance their investments by bank loans as well as bonds, and banks' asset portfolio now consist of loans beside reserves and bonds in simple terms. Within this three assets framework, banks play a significant role in the determination of output dynamics, which is not the case in the two assets framework of the money view.

Market imperfection in the banking system is one of the crucial points that contribute to the presence of a credit channel. Bernanke and Gertler (1987, 1989, 1995) point to capital

market frictions originating from imperfect information aspects. Heterogeneous structure of borrowers in the credit markets incurs different costs to lenders in evaluating and monitoring credit contracts. Informational asymmetry between the lender and borrower puts a wedge between the costs of internal and external funds, which is being referred to as "external finance premium" by Bernanke and Gertler (1995). It is argued that the potency of the monetary policy is reflected not only by interest rates, but by the external finance premium as well[2]. Thus, Bernanke and Gertler (1995: 28) state that the credit channel is not a distinct, independent or a parallel channel, but rather "…a set of factors that amplify and propagate conventional interest rate effects".

The influence of monetary shocks on real economic activity has two dimensions in the credit view. First, a monetary shock can influence the financial position or the net worth of a borrower firm. A higher net worth of a firm's balance sheet makes external financing from the loan market possible and, hence, stimulates investment decisions. As the transmission of monetary shocks to the real economy occurs through the borrowers' balance sheets, this channel is called the *balance sheet channel*. Second, a monetary shock can influence the banks' loan supply to bank-dependent firms. This change in the availability of loans influences the investment decisions of the borrower firms by reducing an external source of finance. The transmission through such a channel is called the *bank lending channel*.

Balance Sheet Channel

The balance sheet approach to the monetary transmission mechanism embodies the features that links a firm's investment decision with monetary shocks through changes in the firm's financial position. Interest rate effects of a monetary shock have two direct effects on the net worth of a borrower firm; first, by influencing interest payments on outstanding debt, and second by influencing the asset prices. The former influences the net cash flow and profits of the firm while the latter influences the value of collateral assets of the borrower firm. Moreover, as an indirect effect, a monetary shock influences the spending of the firm's customers thereby influencing the wedge between the revenues and fixed costs of the firm in the short-run. Both of these direct and indirect effects determine the firm's net worth and credit-worthiness and hence the firm's borrowing capability from the loan market. As a result, the extent to which the real economy is affected depends on how external finance premium and balance sheets of firms are affected by monetary shocks.

[2] See Kashyap, Stein and Wilcox (1993) about how a tight monetary policy affects the composition of firms' external finance by shifting loan supply, and hence how it affects the investments.

Bank Lending Channel: The bank lending approach to the monetary transmission mechanism appears to be another important channel of credit view as there are bank-dependent borrowers who have few or no alternative sources of finance other than bank loans. Any frictions in the asset-liability management of banks due to monetary shocks would be transmitted to real economic activity through the bank-dependent producers in the economy. A tight monetary policy draining reserves from the banking system would restrict the supply of loanable funds so that it increases the external finance premium of the bank-dependent borrower firms. The effect of a monetary shock on the external finance premium of small size firms is assumed to be higher than it is on large ones under the assumptions that large size firms have easier access to credit markets and have more alternative sources of finance. In this sense, output fluctuations due to monetary shocks can be explained not only by interest rate effects, but by external finance premium effects as well. Presence of an active bank lending channel may serve to explain the amplified and propagated conventional effects of policy shocks. It has to be noted that since the bank lending channel focuses only on the lending behaviour of banks affected by monetary policy shocks, this transmission channel view is assumed to be a narrow-type credit channel approach.

2.2. Asymmetric Information and Bank Lending Behaviour

Since the scope of this study is limited to bank behaviour in the operation of credit channels, the focus will be on how credit market imperfections are related to the bank lending behaviour or the bank lending channel of the monetary transmission process. In this perspective, Kashyap and Stein (1994, 1995, 2000) have contributed to the credit view literature with significant theoretical and empirical studies. As argued in Kashyap and Stein (1995: 153), "there is no a priori reason to think that capital market imperfections should be less important for banking firms than for non-financial firms".

Similar to the dynamics behind how external finance premium for non-financial firms are affected by credit market imperfections, banks, too, can experience frictions in raising non-deposit external finance. Sometimes, banks themselves are borrowers from domestic and international financial institutions, and thus, implications of informational asymmetries for credit contracts arranged between banks and their creditors cannot be ignored in shaping bank lending behaviour. Moreover, banks can raise external finance from the public or institutions through mutual funds or certificates of deposit. Unless these financial instruments or other non-deposit sources of finance are insured officially, the costs of informational asymmetry to investors will be nonzero, and therefore, investors will behave selectively by seeking to

purchase the instruments of banks with a good reputation or by challenging return opportunities. However, gaining reputation or providing challenging opportunities increases the banks' costs of raising external finance. As a result, frictions in the liability side of bank balance sheets due to costs of raising non-deposit external finance would generate real effects on the asset side. The potency of a bank lending channel significantly depends on these real effects on assets, especially on bank loans.

The influence of informational frictions in raising external funds on bank lending behaviour can be identified through allowing a cross-sectional categorization among banks in terms of their varying characteristics. In this context, Kashyap and Stein (1995) categorize banks in terms of their asset size, while Kashyap and Stein (2000) emphasize the liquidity structure of banks along with the asset size. Asset size can be considered as a proxy for informational costs of raising external funds while liquidity is assumed to be an indicator of robustness towards policy shocks. In this sense, small size banks are assumed to be exposed to higher informational costs than large ones in raising external funds, and therefore, any policy shock to the liabilities of banks would generate more significant real effects on the assets of small banks. However, small size banks with high liquidity ratios may endure monetary policy shocks without significantly changing their lending behaviour. Therefore, categorizing banks in terms of their balance sheet liquidity provides evidence in identifying the loan supply effects of monetary policy shocks on bank assets. Especially, as argued by Kashayap and Stein (2000), the stronger lending response of small illiquid banks is an indicator of a loan supply effect rather than a cyclical demand effect. Thus, differentiating the loan supply effect from a loan demand effect appears to be a crucial point in investigating the presence of a bank lending channel.

2.3. The Effectiveness of Monetary Policy on Bank Lending

The credit view literature provides evidence on the real effects of monetary policy and, in this regard, the bank lending channel in the credit view clarifies the link between bank balance sheets and these real effects. Bernanke and Blinder (1992) argue that a tight monetary policy affects the composition of bank assets: a contraction in deposits, first, causes a liquidation of security stocks and then, a contraction in loans with a certain lag due to their quasi-contractual commitment characteristics. However, whether the change in the composition of bank assets would generate real effects or not depends on how banks of different characteristics respond to the monetary policy.

Categorization of banks with respect to the asymmetry in their costs of raising external funds would be a basis for revealing the disproportionate effects of monetary policy on bank balance sheets and, hence, on bank lending. The disproportionate effects on loans, when transmitted to bank dependent borrowers are expected to influence the real economic activity through the bank lending channel of the monetary transmission mechanism. However, there are some preconditions for the lending channel to operate[3]. First, there should be borrowers whose investment decisions are primarily dependent on bank finance. Second, monetary authority should be capable of influencing bank lending behaviour through the policy instruments.

The existence of bank dependency in the credit markets may be explained by the fact that high fixed costs of evaluating and monitoring investment projects encourage firms to arrange loan contracts with banks rather than with non-bank institutions. As stated in Kashyap and Stein (1994:228), bank dependent borrowers exist because loan contracts arranged with banks are "taken as good news by the stock market" and moreover, there are "lender-specific lock-in effects" which make some borrowers prefer to continue their established relationships with banks. Additionally, there are investment projects that require information-gathering technologies accessible only by banks. The lock-in effects may be one of the outcomes of this technological monopoly.

The effectiveness of monetary policy on lending behaviour depends on both the structure of credit markets and asset-liability management aspects of banks. The existence of non-bank institutions as lenders in credit markets may weaken the influence of monetary policy on the bank lending behaviour. However, Kashyap and Stein (1994:229) argue that the role of non-bank institutions as "marginal lenders" is not challenging because of the fact that lock-in effects incur significant costs on borrowers while switching to other sources of credits.

In the context of asset-liability management, weak policy effects are of concern when banks are able to resist monetary policy by liquidating their security portfolios or by raising non-deposit or non-reservable funds to continue lending. Both for tight monetary policy shocks and for deposit withdrawals, banks hold liquid assets as buffer stocks by giving up lending. Although the substitution between the loans and the liquid assets depends basically on their relative yields, small size banks may prefer to hold higher proportions of securities due to their frictions in raising deposit and non-deposit funds. The heterogeneity in bank lending behaviour increases the potency of a bank lending channel. Note that if banks were

[3] Kashyap and Stein (1994) provide an overview about the preconditions of the lending channel with reference to empirical and theoretical works in the literature.

homogenously able to raise non-reservable funds from capital markets or use securities as buffer stocks during monetary shocks, there would be no room for the monetary authority to be able to exert a policy that generates real effects. As long as credit markets are characterized with asymmetric information and banks exhibit heterogeneity in lending behaviour due to costs of raising external funds, there would be real effects transmitted to the economy through borrowers' distorted investment decisions.

Kashyap (1994) emphasizes the role of risk-based capital requirements in weakening the expansionary effects of monetary policy on bank lending. Under capital requirements, banks are not able to increase loans unless they manage to increase their equity capital. Therefore, monetary expansion leads to an increase only in the security holdings of the banks, without affecting their loan supply.

2.4. An Overview of the Credit Market and Banking in the Turkish Economy

As a preliminary step in the analysis of the bank lending channel, the bank-dependency of firms in Turkey can be investigated simply by analysing the composition of bank assets and the liability side of the consolidated balance sheets of firms. In fact, complete and accurate conclusions on this subject can only be drawn through detailed studies on the broad credit channel, which is beyond the scope of this study.

Consolidated balance sheet data of Deposit Money Banks (DMBs) in Turkey indicate that the average share of credit extended to private companies and individual corporations is 62 % of the total DMBs credit (see Table 2.1). These credits to firms constitute 13 % of the Gross Domestic Product (GDP) in the 1986-2000 period, on the average. The stably increasing share of bank credits to firms in GDP, from 11 % to 18 %, also indicates the increasing role of DMBs as intermediaries in credit markets (see Figure 2.1).

The relatively high share of bank credits as a source of external finance reveals the bank-dependency nature of firms in Turkey. As seen in Table 2.2, two major sources of external finance for firms in Turkey are bank credits and trade credits. With respect to the average figures of the 1989-1999 period, 79 % of the financial debts of the firms are bank credits and this constitutes 22 % of the total liabilities of firms. As the second major source of external finance, firms use trade credits without issuing commercial papers, which constitutes 75 % of the total trade debts of firms. In fact, however, trade credits are also influenced by the availability of bank credits as bank credits may also contribute to the firms' potential for extending trade credits to each other. In this respect, Ersel and Öztürk (1990),

Sak and Ersel (1995) and Atiyas and Yülek (1997) confirm the fact that bank credits appear to be the major source of external finance for the manufacturing firms in Turkey.

The financial liberalization process, which started in the 1980s, has led to the growth of the banking sector in Turkey. With the liberalization attempts, the sector has been opened to competition, and the availability and variety of sources of finance has been increased

Table 2. 1 Credit Composition of Deposit Money Banks 1986-2000

Percentage (%)	**Share in Total Credits**
Companies and Individual Corporations	62
Households	7
Non-financial Public Enterprises	7
Financial Institutions	3
Central Government	2
Local Government	1
Agricultural Sales & Credit Cooperatives	1
Other	17

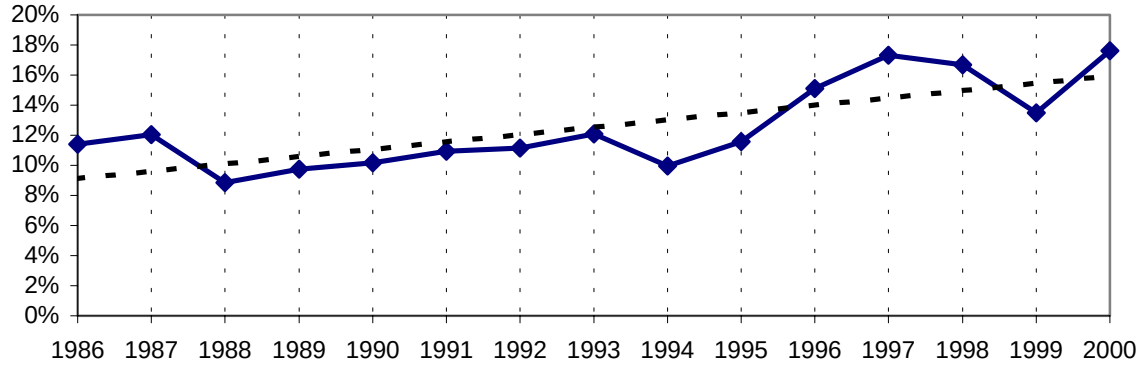
Source: Electronic Data Delivery System of CBRT at http://tcmbf40.tcmb.gov.tr/cbt.html

Table 2. 2 Shares of Consolidated Balance Sheet Items of Firms in the Total Liability, 1989-1999

Percentage (%)	**Share in Total Liability**
Financial Debts	28
(Bank Credits)	*(22)*
Trade Debts	16
(Credits without Commercial Papers)	*(12)*
(Commercial Papers)	*(2)*
Equity Capital	34
(Share-in Capital)	*(16)*

Source: CBRT Sectoral Balance Sheets

Figure 2.1 The Share of Credits to Companies and Individual Corporations in GDP



considerably. The flexible exchange rate regime and the positive real interest rate policy accommodated a substantial growth in the size of bank balance sheets. A significant factor that influenced the structure of bank balance sheets has been the increasing budget deficit

finance through the issue of government securities after mid 1980s. Commercial banks have been the major customers of the government debt instruments since then. In this respect, the monetary authority has been left with a reserve accommodation policy in order not to increase the cost of domestic debt financing. Consequently, this process has led to the expansion of the asset size of the Turkish banking system. High inflation rates and high interest rates as a result of the increasing public debt have shortened the maturity structure of bank liabilities and have led banks to hold higher proportions of government security in liquid assets. The higher real returns and low risk on government securities have been more favourable for backing bank liabilities.

The share of total bank assets in GDP trends upward, from about 40 % in the 1990s to about 80 % towards the year 2000. As seen in Figure 2.2, the balance sheet growth speeds up after 1994. On the asset side, the share of total bank credit stocks in GDP increases to over 20 % after 1994 and the share of government security holdings in GDP, which is around 4 % until 1995, peaks to 13 % afterwards. Figures in Table 2.3 show that in the 1995-2000 period compared to 1986-1994 period, the average security portfolio share of GDP doubles with the doubling average share of government security holdings in GDP. However, the average share of credit stocks in GDP does not grow as fast as that of government security stocks in GDP in the later period. Furthermore, the share of credit stocks in total bank assets on the average falls after 1994. As a result, the growth in the size of bank balance sheets after 1994 is mostly due to the change in the asset composition in favour of government security holdings. Such an outcome indicates the fact that banks' lending to the government through increased holdings of government securities seems to crowd out the funds available to private borrowers after 1994. As Figure 2.3 illustrates, the time pattern of the ratio of the change in the government security stocks of DMBs to the public sector borrowing requirement (PSBR) clearly reflects how public deficits have been increasingly financed through the funds of DMBs from 1994 onwards.

On the liability side, due to positive real interest rates, the banks' major source of external finance has always been deposit funds despite their high costs of raising (see Figure 2.2 and Table 2.3). Additionally, the sustained inflationary environment in Turkey and, thus, the tendency for currency substitution, have increased the amount of foreign exchange deposits at banks. The average ratio of deposit funds to the total bank assets has been around 60-70 % in the 1986-2000 period. The introduction of full insurance on deposits in 1994 may further explain the growing share of deposits in GDP after 1994.

As reflected in the second panel of Figure 2.2, the share of non-deposit funds in GDP begins to follow an increasing trend after the liberalization of capital accounts in 1989, except for the interruption of the 1994 financial crisis. However, the major component that feeds the increasing trend of non-deposit funds is the bank credits from abroad. Although the share of non-deposit funds in GDP does not increase substantially –its share in total assets even falls after 1994- the share of foreign credits in total non-deposit funds increases considerably after 1994 (see Table 2.3). However, since the availability of these funds is sensitive to economy wide risks, positive bank specific factors may not be sufficient to raise substantial amounts of

Table 2.3 The Shares of some Balance Sheet Items in GDP and Total Assets

Percentage (%)	**Share in GDP**		**Share in Total Assets**	
	1986-1994	1995-2000	1986-1994	1995-2000
Asset Side Items				
Security Portfolio	5.2	10.5	11.4	15.8
(Government Security Stocks)	*(4.2)*	*(7.9)*	*(9.3)*	*(11.6)*
Credit Stocks	18.3	22.2	40.1	35.4
Liability Side Items				
Deposit Funds	28.8	44.7	61.6	69.4
Non-deposit funds	7.1	8.5	15.4	12.7
(Credits)	*(4.7)*	*(6.6)*	*(10.2)*	*(10.0)*
(Foreign Credits)	*(2.4)*	*(4.9)*	*(5.2)*	*(7.1)*
Equity Capital	1.0	1.5	2.1	2.2

Figure 2.2 The Shares of some Balance Sheet Items of DMBs in GDP

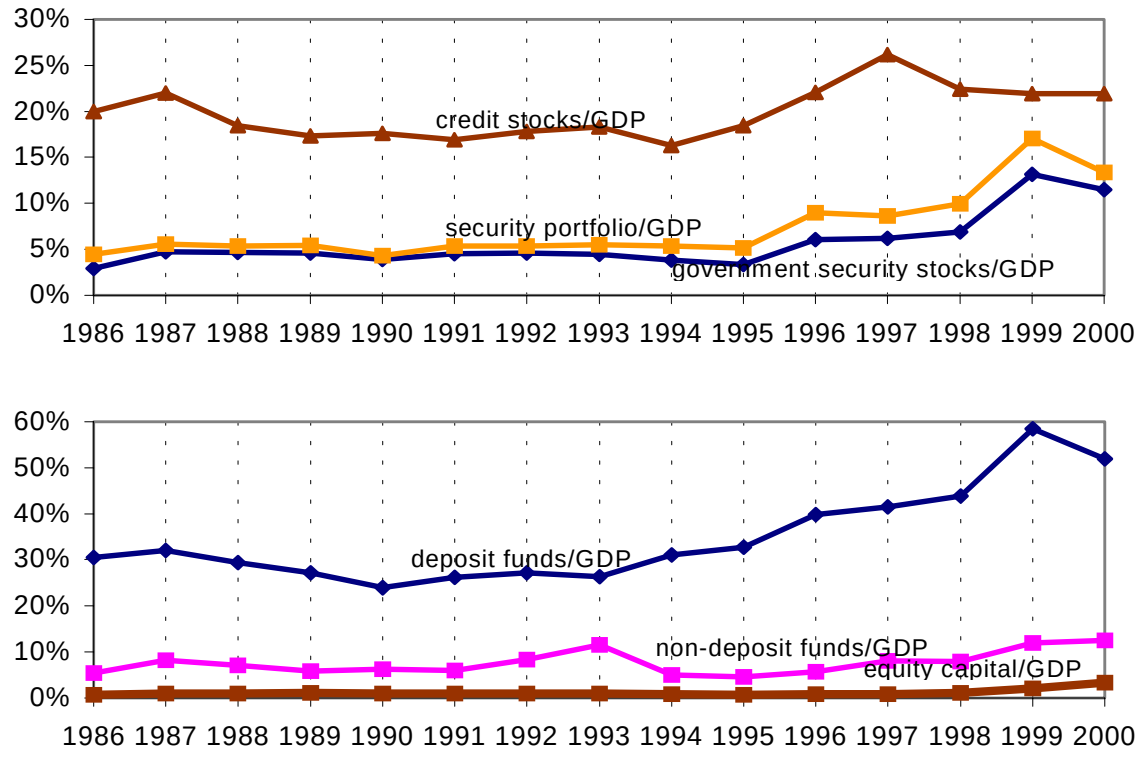
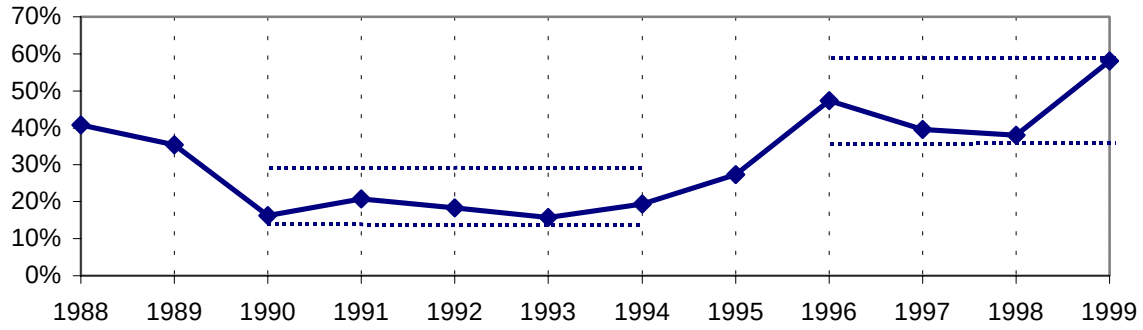


Figure 2.3 Ratio of the Change in the Stock of Government Security Holdings of DMBs to PSBR



Source: Electronic Data Delivery System of the Central Bank of the Republic of Turkey at http://tcmbf40.tcmb.gov.tr/cbt.html

these kind of funds when necessary. In this context, depending on the degree of frictions in raising non-deposit funds, any policy shock to bank deposits seems to require significant reallocation of bank assets.

3. THE EMPIRICAL ANALYSIS

3.1. The Model

Bernanke and Blinder (1988) incorporate the bank lending channel into the goods and money market equilibrium framework through the explicit inclusion of bank loans in the equilibrium dynamics. The basic assumption of this modified framework is that bonds and loans are not perfect substitutes any more as they were in the IS-LM framework and therefore, at present, financial market dynamics are characterized by the supply of and demand for three assets: money, bonds and bank loans.

Owing to the imperfect substitutability of bonds and bank loans, the three assets framework requires a modification to the traditional IS curve so that the new negatively sloped curve is obtained, which is called the CC (commodity and credit) curve by Bernanke and Blinder (1988). Unlike in the IS-LM framework, a shock to bank reserves not only shifts the LM curve due to a change in the quantity of money, but also shifts the CC curve through stimulating firm investments owing to an increased volume of loans. It has to be noted that in the CC-LM framework, monetary shocks can be transmitted to real economic activity without any significant change in bond interest rates because investment demand may be satisfied by increased volume of bank loans, without causing any substantial change in the demand for bonds. Hence, the monetary policy transmission can occur through other ways than the interest rate channel.

The effects of monetary policy on the lending behaviour in the CC-LM framework can be investigated by focusing on a simplified version of a bank balance sheet, following Bernanke and Blinder (1988). The asset side is assumed to consist of bonds (B), loans (L) and reserves (R) –the sum of required reserves (RR) and excess reserves (ER)- while the liability side is assumed to consist of only deposits (D):

$$B + L + R = D \tag{3-1}$$

Required reserves are a fraction of bank deposits depending on the reserve requirement ratio (r) and banks hold excess reserves beyond the level of required reserves depending on the opportunity costs of holding bonds (i_B) and loans (i_L):

$$RR = r.D \tag{3-2}$$

$$ER = \varphi(i_B, i_L).(1 - r).D \tag{3-3}$$

Using R=ER+RR and making the necessary substitutions, the balance sheet constraint of a bank given in (1) can be re-written as

$$B + L = \left[[\varphi(i_B, i_L).(1 - r) + r]^{-1} - 1 \right].R \tag{3-4}$$

where the term in big brackets is a non-constant multiplier that can be denoted by a function $\gamma(.)$. From (3-4), a bank loan supply function as the following can be derived:

$$L^S = \gamma\left(\overset{-}{i_B}, \overset{+}{i_L}, \overset{-}{r}\right).R \tag{3-5}$$

It means that any change in the bank reserves, especially a change in monetary policy, would cause a proportionate change in loans where this proportion γ depends on the rates of return on assets and on the reserve requirement ratio. Higher interest rates on bonds and a higher reserve requirement ratio would slow down the expansionary effects of bank reserves on lending, while higher loan interest rates would stimulate bank lending. However, in fact, the spread between the rates of return on bonds and loans are more plausible in explaining the loan supply movements owing to desired asset substitution behaviour.

According to the model, the loan supply function given with equation (3-5) can be reformulated for a representative banking firm as

$$L_i^S = \gamma\left(i_i^B, i_i^L, r\right)R_i \tag{3-6}$$

where the i-subscript represents the cross-section dimension of the individual bank variables. The reserve requirement ratio r, which is the same for all individual banks, is assumed to act as a scalar in the γ function. Then, the proportion $\gamma(.)$ can be re-written linearly as,

$$\gamma\left(i_i^B, i_i^L, r\right) = \beta + \gamma^*\left(i_i^B, i_i^L\right) \tag{3-7}$$

where the γ^* function can be interpreted as representing the bank's asset portfolio allocation decisions.

In practical sense, observing the interest rates that each individual bank has on the bonds and loans in their asset portfolio seems to be infeasible in terms of data collection. Therefore, a proxy variable can be specified which reflects the portfolio allocation based on the return trade-off between bonds and loans in the bank assets. The share of government security stocks in the total bank assets may serve as an indicator of the substitution between bonds and other assets. After an expansionary deposit shock to the bank balance sheets, an increase in this share implies either a relative contraction or no change in the other bank assets, which implies a reduced potential for new loans. On the other hand, a higher security portfolio share in assets may function as a buffer stock against contractionary deposit shocks and increase the potential for new loans. However, it is expected that the buffer stocking behaviour and the sticky nature of the allocation between liquid and illiquid assets affect the bank lending decision with certain time lags. With regard to these illustrations, the $\gamma^*(.)$ function in the equation (3-7) can be represented as a linear function of an observable individual bank variable, denoted with its cross-section and time dimensions as in the following,

$$\gamma^*\left(i_{it}^B, i_{it}^L\right) = \delta\, b_{i,t-1} \tag{3-8}$$

where $b_{i,t-1}$ is the one-period lagged value of the government security stocks share in total assets of each individual bank. Then, the loan supply function given by the equation (3-6) becomes

$$L_{it}^S = \left(\beta + \delta\, b_{i,t-1}\right)R_{it} \tag{3-9}$$

indicating that the loan supply of the i-th bank at time t is determined proportionally to the change in its reserves, where this proportion is represented by $(\beta + \delta\, b_{i,t-1})$.

For estimation purposes, the loan supply function in (3-9) can be transformed into a linear stochastic dynamic model of bank lending as in:

$$\Delta \ln L_{it} = \alpha \Delta \ln L_{i,t-1} + (\beta + \delta b_{i,t-1}) \Delta \ln R_{it} + \phi' z_{it} + \lambda_t + \eta_i + v_{it} \qquad (3\text{-}10)$$

where 'ln' denotes the natural logarithm while 'Δ' is a first-difference operator. According to this model, the loan growth rate ($\Delta \ln L_{it}$) is explained by its lagged values ($\Delta \ln L_{i,t-1}$), by the proportion of the bank reserves growth rate ($\Delta \ln R_{it}$) and by some other balance-sheet-specific factors (z_{it}), which are expected to influence the bank lending behaviour significantly. However, to observe the response of the bank lending behaviour to a change in the monetary policy, the growth rate of bank reserves at the individual bank level is not an appropriate indicator of the policy change. It is not eligible for differentiating the supply and demand effects of the monetary policy on the bank loans, which generates an identification problem in the estimation process. Therefore, "the change in the reserve requirement ratio (Δr_t)", which is the main determinant of the change in the level of bank reserves, should rather be used as a proxy variable for the monetary policy indicator. Fortunately, the absence of the cross-section dimension of this variable reflects the fact that a policy change hits all the banks with the same sort of shock. Consequently, any response in the loan supply can be interpreted as a supply shock led by the monetary authority's policy decision on setting the reserve requirement ratio. Within this context, the model (3-10) should be denoted as

$$\Delta \ln L_{it} = \alpha \Delta \ln L_{i,t-1} + (\beta + \delta b_{i,t-1}) \Delta r_t + \phi' z_{it} + \lambda_t + \eta_i + v_{it} \qquad (3\text{-}10')$$

After some brief information about the data resources, the following sections present the dynamic panel data estimation results of the bank lending model with its variants under different bank categories mentioned in the previous part of the thesis. In the recent literature on the bank lending channel of the monetary transmission mechanism, Kashyap and Stein (2000) and Favero et al. (1999) have employed similar models to estimate the bank lending behaviour in the US and European countries respectively. However, although the modelling strategy does not diverge from theirs considerably the estimation methodology employed in this study has superior features in econometric sense as is going to be stated in the next section.

3.2. The Econometric Methodology

The use of panel data, pooling the cross-sectional and time series dimensions of the data, in economic analysis is more informative than the one-dimensional data analysis,

especially in the analysis of macroeconomic subjects with microeconomic dynamics at the firm level. The estimation biases due to the individual heterogeneity of cross-sectional units and biases due to the cross-sectional aggregation of the data can be reduced through the use of panel data estimation methods. However, the panel data models incorporating the dynamic nature of the macroeconomic relationships involve more improved approaches than the standard panel data estimation methods.

The following represents a first-order dynamic panel data model

$$y_{it} = \alpha y_{i,t-1} + \beta'(L)x_{it} + u_{it} \qquad i = 1,\ldots\ldots,N \qquad t = 1,\ldots\ldots,T$$

where $u_{it} = \lambda_t + \eta_i + v_{it}$ is an error term with time (λ_t) and individual (η_i) effects, L is a lag-operator and x_{it} is a vector of explanatory variables. The "it" subscripts of the variables denote the observation of the i-th cross-sectional unit in the t-th period. The inclusion of a lagged dependent variable in the standard panel data models leads to biased and inconsistent Ordinary Least Squares (OLS) estimators because of the correlation between $y_{i,t-1}$ and u_{it}. This correlation is due to $y_{i,t-1}$'s being a function of the individual effects η_i as a result of y_{it}'s being a function of η_i in the regression. Therefore, a transformation is needed so that it induces uncorrelated error terms and individual effects in the model. In this respect, neither Within Transformation of the fixed effects estimator nor the random effects Generalized Least Squares (GLS) estimator is an unbiased and consistent estimator.

A first-difference transformation suggested by Anderson and Hsiao (1981) produces consistent estimators with an instrumental variable estimation[4]. However, the Generalized Method of Moments (GMM) estimation, suggested by Arellano and Bond (1991), provides efficiency improvements by exploiting the available moment conditions in the first difference transformation. Further, Arellano and Bover (1995) propose an extended GMM estimation in which additional moment conditions are imposed to gain more precision in estimations. In addition to the instruments available for the first-differenced equations, other valid instruments are specified for the equations in levels. In Blundell and Bond (1998), where the efficiency improvement of this extended GMM approach has been verified, the estimation performed with the instruments for both the first-differenced and levels equations is called the

[4] See Baltagi (1995) for a detailed discussion of panel data topics and the related literature on the dynamic panel data estimation, and see Erlat (1997) for a later survey of panel data topics.

system GMM estimation and denoted by GMM-SYS, while that for only first-differenced equations is called the standard first-differenced GMM estimation and denoted by GMM-DIF.

Arellano and Bond (1991) provide diagnostic testing procedures to test the validity of the model specification in dynamic panel data estimations. The first test statistic for testing the overall significance of the independent variables is a ***Wald test***, which is asymptotically distributed as χ^2 with the degrees of freedom computed with respect to the number of restricted coefficients. The same statistics can also be computed to test the significances of the time and individual effects.

The null hypothesis of the validity of the GMM instruments can be tested by a ***Sargan test*** of over-identifying restrictions. This test is asymptotically distributed as χ^2 with the degrees of freedom computed with respect to the number of the over-identification restrictions. Similarly, a ***Difference-Sargan test*** statistic can be computed to test the validity of GMM-SYS estimates against GMM-DIF estimates, by testing the significance of the instruments used in levels equations as additional parameters. The statistic is simply the difference between the two Sargan test statistics computed with the GMM-SYS and GMM-DIF estimates respectively. The distribution of this statistic is χ^2 with the degrees of freedom equal to the number of instruments used in levels equations. It has to be noted that only the two-step GMM estimation produces heteroskedasticity-consistent Sargan tests.

The consistency of the GMM estimates requires non serial-correlated errors v_{it}. In this regard, two test statistics can be computed to test for the absence of first- and second-order serial correlations in the first differenced residuals, which are denoted by $\mathbf{m_1}$ and $\mathbf{m_2}$ in the context of Arellano and Bond (1991). These two statistics have standard normal distributions asymptotically. As stated by Arellano and Bond (1991: 281), "[S]ince the v_{it} are first differences of serially uncorrelated errors, $E(v_{it}\ v_{i,t-1})$ need not be zero, but the consistency of the GMM estimators above hinges heavily upon the assumption that $E(v_{it}\ v_{i,t-2})=0$." Thus, the small value of $\mathbf{m_2}$ statistics is the indication of the absence of the serial correlation problem.

In this study, the model estimations that are going to be performed by the GMM approach make use of a two-step GMM estimation that results in asymptotically more efficient standard errors than a one-step GMM estimation. However, the standard errors of the coefficients are computed with a small-sample variance correction suggested by Windmeijer (2000) to eliminate a downward bias in the standard errors of the two-step estimators. The test statistics computed for the models are based on the two-step residuals.

The GMM instruments that are going to be employed in the two-step estimations of the interested models can be represented in general notation as follows:

For first-differenced equations: $y_{i,t-2}$, $y_{i,t-3}$, $y_{i,t-4}$; $x_{i,t-2}$, $x_{i,t-3}$, $x_{i,t-4}$

For levels equations: $\Delta y_{i,t-1}$; $\Delta x_{i,t-1}$

In the first-differenced equations, the lags of the instruments are limited up to 4 periods not to cause finite sample biases as a result of using numerous instruments, because the number of regressors in the models is high and the cross-sectional sample size used in the empirical analyses is not large enough due to data unavailability.

In the empirical analysis of bank lending behaviour, using the GMM estimation approach rather than the OLS approach allows the control of unobserved heterogeneity and simultaneity in the panel data estimation. The heterogeneity resulting from bank-specific effects, and the possible simultaneity between these individual effects and the regressors, can be taken into consideration in estimations through the GMM approach. Moreover, the GMM estimation produces more efficient estimators against the problem of the potential endogeneity of the regressors. In this respect, the regressors of the models used in the empirical part of the thesis are variables from bank balance sheets that are inevitably correlated with each other. Therefore, the superiority of a GMM type estimation approach in dynamic modelling of bank lending behaviour is obvious.

3.3. The Data

The analyses are based on the balance sheet data of 58 deposit money banks (DMBs), covering the period of 1988-1999 in Turkey[5]. The starting year coincides with the beginning of the regular publication of the balance sheet data in *Banks in Turkey*, which is published yearly by The Banks Association of Turkey. However, the ending year of the data is limited to 1999 because of the fact that the banking sector has been experiencing a tremendous re-structuring process since mid-1999 through amendments in the banking legislations and through the ownership transfers of some banks to the Saving Deposit Insurance Fund.

The bank balance sheet data employed in the empirical investigations exclude the data of banks that have not operated at least five years in order to avoid deficiencies in econometric estimations due to an insufficient time-dimension.

[5] The list of the DMBs employed in the empirical analyses is given in the Appendix.

The frequency of the data is yearly and the figures of the bank balance sheets represent the end-of-year records of the items. Although it is known that a quarterly data set is more relevant for the reflection of the balance sheet dynamics on bank lending behaviour, the time span of the available quarterly data at the individual bank level is very short for econometric investigations.

The source of the time series data used in the empirical analyses is the Electronic Data Delivery System and the various publications of the Central Bank of the Republic of Turkey.

3.4. Estimation Results

The impact of monetary policy on the bank lending behaviour of deposit money banks and the transmission of this impact to bank dependent firms constitutes the basis for defining a bank lending channel of the monetary transmission mechanism. Following the approach in Kashyap and Stein (2000), the bank lending channel can be empirically tested by investigating bank lending response at individual bank level. The disproportionate loan supply effects of shocks to bank reserves reflect the different degrees of friction in banks' raising funds against monetary shocks. This variation in the degrees of friction can be explained with financial market imperfections, the outcomes of which are magnified for some banks with weak balance sheet features. In this context, the disproportionate effects reflected on bank dependent firms might imply real effects on the aggregate economy.

Within the framework of the above underpinnings provided by economic theory, the variants of the loan supply function given by equation (3-10′) are employed in testing the bank lending view. The basic loan supply regression equation is

$$\Delta \ln L_{it} = \alpha \Delta \ln L_{i,t-1} + (\beta + \delta b_{i,t-1})\Delta r_t + \sum_{j=0}^{1} \phi_j c_{i,t-j} + \sum_{j=0}^{1} \varphi_j s_{i,t-j} + \sum_{j=0}^{1} \gamma_j \Delta \ln B_{i,t-j} + \lambda_t + \eta_i + v_{it} \qquad (3\text{-}11)$$

In equation (3-11), the definitions of the variables are as follows:

L_{it}: total bank loans deflated by the GNP deflator (1987=100).

Δr_t: the change in the reserve requirement ratio (the ratio is the rate on 3-month to 1-year time deposits)

b_{it}: government security stocks / total assets

c_{it} : share holders' equity + net income / deposits + non-deposit funds

s_{it}: total security portfolio / total assets

B_{it}: government security stocks deflated by the GNP deflator (1987=100).

In the model, the growth rate of bank loans is not only explained by the change in the monetary policy, but also by some balance-sheet-specific factors such as the bank capital ratio and the security-asset ratio, represented by the variables c_{it} and s_{it} respectively. The bank capital ratio is an indicator of the balance sheet strength so that a high bank capital ratio implies that the bank can support risks of new lending. The security-asset ratio is an indicator of the bank's portfolio liquidity and, hence, it reflects the relative asset quality of the bank balance sheet. The banks' management of liquid assets to avert from interest rate risk may help providing loanable funds at lower costs and hence, increase bank loans. As such, higher bank capital ratio and security-asset ratio encourage banks to re-allocate funds more to lending in the next period and increase the loan growth rate. Therefore, the expected signs of bank capital ratio and loan-asset ratio in the loan supply models are $\phi, \varphi > 0$.

The government debt instruments held by banks are another factor that determines the loan supply growth rate. Especially in Turkey, where domestic borrowing relies heavily on the resources of the financial markets, it is expected that the growth rate of the loan supply will be closely related to the growth rate of the government security stocks of banks. On the one hand, allocating the bank assets so as to hold more government securities may decrease the availability of private loans. Hence, the expected sign of such behaviour in the model may be $\gamma < 0$ indicating that the domestic debt finance through resources of the banking system crowds out bank loans to the private sector. On the other hand, public debt sales to the banking system may increase the loan supply if these sales are a consequence of a reserve accommodation policy. So, the growth of the government security holdings of banks may as well be positively related to the growth of the bank loans, i.e., $\gamma > 0$, indicating a crowding in effect.

Another point to note is that the increased holdings of securities may serve as buffer stocks to cushion the adverse lending effects of shocks to bank reserves. This buffer stock function of government security stocks is incorporated in the model through the variable $b_{i,t-1}$. For instance, if a contractionary monetary shock to a bank balance sheet occurs, the growth rate of the loan supply may not decrease despite the contractionary effects on bank reserves, because banks with high values of $b_{i,t-1}$ ratio can continue lending by liquidating their security stocks. This explains the buffer stocking function of the security portfolio in the bank assets. However, if the banks with a high $b_{i,t-1}$ ratio do not follow a buffer stock behaviour, then

holding high ratios of security stocks can simply be explained by a risk aversion motive. Thus, the expected signs of the relation between the change in the policy variable and the loan supply growth rate in the model are $\beta<0$ and either $\delta>0$ or $\delta< 0$, depending on the presence of a buffer stock behaviour or a risk aversion motive respectively.

Bank size matters to bank lending behaviour because of the fact that smaller banks experience more frictions in raising external finance and because they are exposed to more default risk due to the high costs of evaluating and monitoring loan contracts. Although small banks have lower shares in the credit markets, a monetary shock that affects their lending behaviour may generate significant real effects in the aggregate economy. As argued by Hancock and Wilcox (1998), loans of small banks are "high powered" so that the marginal effect of a reduction in their loans has more significant effects on economic activity than does that of a reduction in large banks' loans. The disproportionate loan supply responses of banks to reserve shocks due to their size differences may provide evidence for the occurrence of real output effects transmitted by a bank lending channel.

In order to reflect the bank size effects of a policy change on bank lending behaviour, the loan supply model given in equation (3-11) can be modified as follows:

$$\Delta \ln L_{it} = \alpha \Delta \ln L_{i,t-1} + \sum_{j=1}^{4} S_j \left(\beta_j + \delta_j b_{i,t-1}\right)\Delta r_t + \sum_{j=0}^{1} \phi_j c_{i,t-j} + \sum_{j=0}^{1} \varphi_j s_{i,t-j} + \sum_{j=0}^{1} \gamma_j \Delta \ln B_{i,t-j} + \lambda_t + \eta_i + v_{it} \qquad (3\text{-}12)$$

In equation (3-12), S_j denotes the size-dummy variables in four size categories:

$S_1 = 1$ for banks with assets below 150 million \$
$= 0$ otherwise
$S_2 = 1$ for banks with assets between 150-500 million \$
$= 0$ otherwise
$S_3 = 1$ for banks with assets between 500-1500 million \$
$= 0$ otherwise
$S_4 = 1$ for banks with assets above 1500 million \$
$= 0$ otherwise

The signs of the regression coefficients related to these size-dummy variables are expected to be the same as mentioned before, i.e., $\beta_j<0$ and $\delta_j>0$ or $\delta_j<0$. However, the relative

magnitudes of the sums of β and δ for each bank size are expected to be as follows: $|\beta_1+\delta_1| > |\beta_2+\delta_2| > |\beta_3+\delta_3| > |\beta_4+\delta_4|$. The sum of the β and δ coefficients represents the total loan supply responses, including the loan supply effects of banks' holding securities for buffer stocking and risk aversion purposes. These relative magnitudes imply that the loan supply responses of banks to the monetary policy change become higher as the bank size decreases.

The two-step GMM estimation results of the loan supply models (3-11) and (3-12) are exhibited in Table 3.1 together with OLS estimations to allow the efficiency comparison. The estimated models pass the specification tests. The Sargan test statistics approve the validity of the GMM instruments. According to the m_1 and m_2 test statistics, the consistency of the GMM estimators is verified, as there is no evidence of a second-order serial correlation in the differenced residuals of the models. Further, the Difference-Sargan test statistics provides no evidence to reject the null hypothesis of the validity of the additional moment conditions used in the GMM-SYS estimations. Therefore, the ultimate economic inferences derived from the models can be based on the GMM-SYS estimators.

In the GMM-SYS estimates of the model (3-11) presented in Table 3.1, no significant monetary policy effect on the loan supply growth could be found. The model (3-12), which is the modified version of the model (3-11) formulated by incorporating bank size effects on the bank lending behaviour, also has the same finding. The absence of such an influence under the bank size categorization rules out the evidence for the potential of a bank lending channel to exist in the monetary transmission process. The lack of a relationship between the monetary policy and the bank lending may be due to two reasons. First, the monetary policy effects on bank lending decisions may be neutralised by some other effects. Bank lending decisions may be more responsive to bank specific factors such as balance sheet strength and portfolio risk than to changes in the monetary stance. Second, the reserve requirement ratio may not be an effective monetary policy instrument for the control of the bank reserves. It may appear as a result of the fact that policy instruments become useless when an accommodative monetary action has to be followed by the monetary authority - especially when there is an increasing need for domestic debt finance as there is in Turkey. In these respects, the estimated regression coefficients of the explanatory variables that are common to both of the models (3-11) and (3-12) indicate some evidence for these two reasons of monetary policy ineffectiveness.

Table 3.1 The Estimation Results of the Loan Supply Models (3-11) and (3-12)

	Model (3-11)			Model (3-12)		
$\Delta \ln L_{it}$	**OLS**	**GMM-DIF**	**GMM-SYS**	**OLS**	**GMM-DIF**	**GMM-SYS**
Constant	-0.289* *0.122*	-0.029 *0.019*	-0.146 *0.178*	-0.289* *0.122*	-0.026 *0.019*	-0.257 *0.203*
$\Delta \ln L_{i,t-1}$	-0.143 *0.077*	-0.179* *0.086*	-0.208* *0.089*	-0.139 *0.078*	-0.185* *0.089*	-0.175 *0.091*
Δr_t	-0.002 *0.014*	-0.006 *0.016*	-0.009 *0.029*			
$S_1.\Delta r_t$				-0.055 *0.037*	-0.061 *0.214*	-0.462 *0.420*
$S_2.\Delta r_t$				0.038 *0.065*	0.547 *0.742*	0.602 *0.715*
$S_3.\Delta r_t$				0.007 *0.009*	-0.169 *0.323*	0.057 *0.392*
$S_4.\Delta r_t$				0.014* *0.006*	0.102 *0.902*	0.016 *0.617*
$b_{i,t-1}.\Delta r_t$	0.077 *0.099*	0.110 *0.112*	0.160 *0.198*			
$S_1.b_{i,t-1}.\Delta r_t$				0.254 *0.279*	0.755 *2.004*	3.409 *3.140*
$S_2.b_{i,t-1}.\Delta r_t$				0.009 *0.356*	-2.598 *2.483*	-1.258 *2.647*
$S_3.b_{i,t-1}.\Delta r_t$				0.023 *0.058*	1.519 *2.319*	-0.554 *3.225*
$S_4.b_{i,t-1}.\Delta r_t$				-0.037 *0.044*	-1.497 *5.704*	-1.194 *4.715*
$c_{i,t}$	-0.006 *0.006*	-0.011 *0.009*	-0.014 *0.008*	-0.006 *0.006*	-0.010 *0.009*	-0.012 *0.008*
$c_{i,t-1}$	0.021** *0.008*	0.041** *0.014*	0.029** *0.010*	0.021** *0.008*	0.043** *0.012*	0.028** *0.009*
$s_{i,t}$	-0.019 *0.010*	-0.016 *0.014*	-0.020 *0.014*	-0.019 *0.010*	-0.022 *0.012*	-0.023* *0.011*
$s_{i,t-1}$	0.031** *0.011*	0.026* *0.012*	0.022** *0.008*	0.031** *0.012*	0.030* *0.012*	0.032** *0.012*
$\Delta \ln B_{i,t}$	0.189** *0.072*	0.216** *0.062*	0.257** *0.069*	0.195** *0.073*	0.219** *0.062*	0.263** *0.074*
$\Delta \ln B_{i,t-1}$	0.012 *0.031*	0.019 *0.037*	0.063 *0.037*	0.014 *0.031*	0.026 *0.042*	0.047 *0.045*
Wald Tests						
Joint	20.5*(9)	51.8**(9)	32.0**(9)	94.9**(15)	112**(15)	38.6**(15)
Dummy	74.7**(10)	49.4**(9)	49.9**(10)	71.1**(10)	50.1**(9)	44.1**(10)
Time	67.9**(9)	49.4.6**(9)	46.2**(9)	67.9**(9)	50.1**(9)	37.9**(9)
Specification Tests						
Sargan		43.7(111)	43.1 (156)		40.8 (177)	35.1 (249)
Diff-Sargan			-0.6 (45)			-5.73 (72)
$m_1 \sim N(0,1)$	-1.15	-2.04*	-1.85*	-1.39	-2.24*	-2.15*
$m_2 \sim N(0,1)$	1.29	0.67	0.36	1.42	0.94	1.09

Notes: **(1)** Figures in italics under the coefficient estimates are standard errors. Figures in parentheses are degrees of freedom. Asterisks * and ** indicate significance at 5 % and 1 % levels. **(2)** Time dummies are included in the regression estimations. **(3)** The *differenced equation* instruments are 2- to 4-lagged values of all variables while the *level equation* instruments are 1-lag 1st differenced variables. **(4)** Computations are done with DPD 1.2 for Ox and the details on computations can be found in Doornik, Arellano and Bond (2001).

The statistically significant coefficients of the variables $c_{i,t-1}$ and $s_{i,t-1}$ in the models, as seen in Table 3.1, indicate the crucial role of bank-specific factors on lending decisions. The positive relationship between the loan supply growth rate and the one-year-lag value of the capital ratio ($c_{i,t-1}$) indicates that the adequacy of the bank capital to meet short-term liabilities is an encouraging factor for banks' future loans. Moreover, the security-asset ratio (s_{it}), which is an indicator of the liquidity and the quality of the asset portfolio, has a plausible relationship with the loan supply growth rate. The positive relationship between the lagged value of the security-asset ratio and the loan supply growth rate asserts the stimulation effect of hedging short-term liability risks on future loans. In other words, lower liquidity and interest rate risks attained through holding short-term securities with high returns relieve the asset risk management task and hence, allows generating new funds for lending at lower costs.

The coefficient estimates of the variable $\Delta \ln B_{i,t}$ in the models give some clue about the statistical insignificance of the loan supply effect of a change in the monetary policy (Δr_t) which can be interpreted as the monetary authority's lack of control on bank reserves. The variables $\Delta \ln B_{i,t}$ and its one-period lag are included in the models in order to reveal the influence of domestic debt dynamics on the lending behaviour of banks in Turkey. As seen in Table 3.1, the statistically significant coefficient of $\Delta \ln B_{i,t}$ estimated in both models (3-11) and (3-12) is an indication of how debt sales to the banking system affect the supply of bank loans. The growth rate of the loan supply is computed to be positively associated with the growth rate of government debt holdings of deposit money banks, consistent with the reserve accommodation policy of 1990s in Turkey. The increase in debt finance through domestic borrowing has not only been putting a fiscal pressure on money markets, but also decreasing the scope for an independent monetary policy. In order not to increase the cost of domestic debt financing monetary authority had to follow an accommodative monetary policy. The high levels of public sector borrowing requirements in Turkey, and the heavy reliance on domestic borrowing have led to the dominance of public debt instruments on financial market dynamics. In this regard, debt sales to the banking system influence the money stock in the form of an endogenous response to the fiscal policy and hence, this weakens the causation from monetary policy instruments to monetary aggregates in Turkey[6].

[6] See Özmen and Koru (2000) for a study investigating the budget deficits and money growth relationship in the Turkish economy.

The failure in finding a statistically significant relationship between the loan supply growth rate and the change in the monetary policy indicator weakens the empirical evidence for a bank lending channel to exist in the Turkish economy. However, estimation results point out a significant accommodative characteristic of loan expansion at the individual bank level, which may explain the absence of the relationship between monetary policy and the supply of bank loans in Turkey.

4. CONCLUDING REMARKS

This study investigated the lending behaviour of deposit money banks in Turkey in order to test the presence of a potential for the bank lending channel. In doing this, the balance sheet data of 58 deposit money banks have been used for the period 1988-1999. The testing procedure has been based on the dynamic panel data estimations of loan supply models, on the premise that the loan supply responses of banks to reserve shocks have implications for the presence of a bank lending channel.

The fact that firms are dependent on bank loans for investment finance and working capital needs renders the real economy vulnerable to shocks in bank lending behaviour. It has been assumed that these shocks have real effects when they are distributed disproportionately on firms. The different structural characteristics of banks can be the reason for the disproportionate lending effects in the real economy. Therefore, the loan supply models estimated in the empirical part of the study have also been formulated with specifications reflecting the disproportionate loan supply effects of banks as a result of their size differences.

The results of the loan supply model estimations provide no evidence of a potential for a bank lending channel to exist in the Turkish economy. Such an outcome is reflected in the lack of a significant relationship between the change in the monetary policy indicator and the real growth rate of the loan supply in the estimated models. Categorizing the loan supply responses of banks with respect to bank size differences has not provided any significant improvement in revealing the evidence of an active bank lending channel. The empirical results indicate that bank lending behaviour is influenced significantly by bank specific factors such as the balance sheet strength and the quality of the asset portfolio, and by debt sales to the banking system.

The lack of the monetary policy control on bank reserves may be interpreted as an outcome of the heavy reliance of banks on government debt instruments in the asset management task, particularly in bank reserve management. Due to the fact that the

government debt instruments can be hold against liquidity requirements and used as collateral in the interbank money market, deposit money banks prefer to hold a high share of their assets in the form of government securities. This may be considered to crowd out funds for private loans available to bank dependent borrowers on the one hand and crowd in private loans through its advantages in the management of portfolio risk on the other hand. However, no evidence of a crowding-out-effect could be found in the empirical analysis at the individual bank level. On the contrary, the positive relationship found between the real growth rate of the government security holdings of banks and the real growth rate of bank loans indicates a crowding-in-effect in bank balance sheets. This effect can be explained by the reserve accommodation policy that monetary authority had to follow inevitably under the fiscal conditions dominated by public sector debt dynamics in Turkey. Because deposit money banks' are the major customers in the domestic debt market, the expansion in the asset demand of the banking system is supported by the accommodative monetary policy. The constraint of not increasing the cost of domestic debt financing puts fiscal pressure on the effectiveness of monetary policies. Any failure in domestic debt financing would call for the monetisation of the public sector deficits.

As the result of the dominance of the public debt instruments over the financial market dynamics associated with the accommodative monetary policy, the control of the monetary authority on the money stocks becomes questionable. In this respect, analysing the presence of a bank lending channel under these conditions appears to be misty unless an effective exogenous supply shock to bank reserves could be defined successfully. Observing any asymmetry in the loan supply effect of a monetary policy on banks seems to be possible provided that the monetary authority is capable of controlling bank reserves effectively.

To conclude, the prevalence of reserve accommodation policy, and hence the absence of an effective tight monetary policy, does not enable the observation of disproportionate loan supply effects possible to observe in case of an exogenous monetary policy shock. Thus, the empirical analysis provides no evidence of a bank lending channel. However, the estimation results obviously show that the lending behaviour of deposit money banks in Turkey are significantly affected by the dynamics imposed through the domestic debt finance policy.

Appendix: The List of the Deposit Money Banks Used in the Analyses

SIZE 4		SIZE 3		SIZE 2		SIZE 1	
1. T.C. Ziraat Bankası	P	11. BankEkspres A.Ş.		31. Citibank N.A.	T	46. Midland Bank A.Ş.	T
2. Türkiye İş Bankası		12. Kentbank A.Ş.		32. Tekstil Bankası A.Ş.		47. Türk Sakura Bank A.Ş.	T^+
3. Türkiye Emlak Bankası A.Ş.	P	13. Alternatif Bank A.Ş.		33. YurtTicaret ve Kredi Bankası A.Ş.		48. Abn Amro Bank N.V.	T
4. Yapı ve Kredi Bankası A.Ş.		14. Etibank A.Ş.	P*	34. EGS Bankası A.Ş.		49. Turkish Bank A.Ş.	T^+
5. Türkiye Halk Bankası	P	15. Eskişehir Bankası A.Ş.		35. Arap Türk Bankası A.Ş.	T	50. MNG Bank A.Ş.	
6. Akbank T.A.Ş.		16. İnterbank		36. Milli Aydın Bankası T.A.Ş.		51. Bayındırbank A.Ş.	
7. Türkiye Vakiflar Bankası T.A.O.	P	17. Yaşarbank A.Ş.		37. HSBC Bank A.Ş.	T	52. Adabank A.Ş.	
8. Türkiye Garanti Bankası A.Ş.		18. Demirbank T.A.Ş.		38. SociéteGénérale (SA)	T	53. Banca di Roma S.P.A.	T
9. Pamukbank T.A.Ş.		19. Sümerbank A.Ş.	P*	39. BankKapital Türk A.Ş.	T^+	54. Credit Lyonnais Turkey	T
10. Türk Ticaret Banksı T.A.Ş.		20. İktisat Bankası T.A.Ş.		40. Bnp-Ak Dresdner Bank A.Ş.	T	55. Bank Mellat	T
		21. Toprakbank A.Ş.		41. The Chase Manhattan Bank	T	56. Derbank A.Ş.	
		22. Osmanlı Bankası A.Ş.	T	42. Westdeutsche Landesbank G.	T	57. Habib Bank Limited	T
		23. Finans Bank A.Ş.		43. Oyak Bank A.Ş.		58. Kıbrıs Kredi Bankası Ltd.	T
		24. Koçbank A.Ş.		44. Ulusal Bank T.A.Ş	T		
		25. Türk Dış Ticaret Bankası A.Ş.		45. Sitebank A.Ş.	T^+		
		26. Türkiye İmar Bankası T.A.Ş.					
		27. Şekerbank T.A.Ş.					
		28. Birleşik Türk Körfez Bankası A.Ş.	T^+				
		29. Türk Ekonomi Banaksı A.Ş.					
		30. Egebank A.Ş.					

P and T denote the public and foreign banks respectively.

* Sümerbank A.Ş. and Etibank A.Ş. were privatised in 1995 and 1998 respectively.

$^+$ Birleşik Türk Körfez Bankası A.Ş. and Bank Kapital Türk A.Ş. have become domestically owned in 1995 while Sitebank A.Ş., Turkish Bank A.Ş. and Türk Sakura Bank A.Ş. have become domestically owned in 1997, 1998 and 1999 respectively.

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